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ORGANIC
Gardening

no-till power soil



no-toil power soil

ORGANIC
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Come Get Your No-Toil Soil



Can you ever have that super-rich, dark, and nutritious humus you see in books and neighbors' yards? The answer is yes! And better yet, the work can practically be done for you! Learn the secrets easygoing gardeners have been hiding.

You'll be able to:

- Eliminate unnecessary fertilizing
- Put your bugs to work
- Compost the quick and easy way
- Grow your own fertilizer
- Make the ultimate "no-work" garden—lasagna-style!

Then, kick back and enjoy a nap in your hammock while your plants and vegetables thrive in their no-toil soil.

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Start with the Dirt



Have you been ignoring your soil's fertility, hoping for the best, and wondering whether you've been cheating yourself out of an optimum harvest? Have your gardens been on a steady decline while you keep applying stuff from a bag hoping it will be a cure-all? Do you pile on fertilizer in the hopes of super-enriching your garden soil? If so, it's time to get serious about your soil.

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Testing 1, 2, 3

All gardeners should be taking advantage of one of the best-kept secrets in gardening: the soil test offered by regional cooperative extension services. The soil test is the very first baby step to knock-'em-down power soil, plus it's easy and inexpensive. A fairly comprehensive test usually costs between \$10 and \$20—less than you'd probably spend on fertilizer that a soil test could very well show is not necessary.

Tests usually indicate the acidity or alkalinity (pH) of the soil, levels of phosphorus and potassium, and levels of calcium and magnesium. Exactly what is included in each area's basic test will vary because soils and their problems vary from one region to the next—what might be a common problem in one locale might not even be an issue somewhere else. Believe it or not, soil is multicultural. Simple things, such as the weather, will affect your soil content. Depending on the region, some labs test for substances such as nitrogen, salts, sulfur, and heavy metals. To contact your regional cooperative extension office, check the blue pages of the phone book for a listing for "County Offices" or "Government Services" or "Agricultural Extension," or go online to csrees.usda.gov/Extension.

When you send your soil sample, ask the lab to tailor any recommendations they make to a small garden. (Lab recommendations for remedying soil deficiencies are designed to serve local farmers and are generally given in terms of pounds per acre of land.)

Micro-Machines

Micronutrients, although consumed in only small amounts, are essential to the health of plants. For example, a plant's ability to hold water is depleted with the loss of micronutrients. A lack of minerals such as iron, manganese, copper, zinc, boron, selenium, iodine, silicon, cobalt, chromium, tin, nickel, and lithium could severely stunt the growth of crops. Too little boron will completely halt the growth of a plant. Most soil test services offer micronutrient testing for an additional fee, but adding a well-rounded organic compost to your gardens should provide all the micronutrients your plants need.

Once the soil sample, paperwork, and your questions are sent in, you should receive your results in a couple of weeks.

Results are usually in the form of a chart or graph, and reading the results is sometimes challenging. Following are some common things labs test for and what it all means. Just remember, if you have a "low" reading, you need to add garden amendments that supply that nutrient; "medium" means there are enough nutrients for this season but you will need to add garden amendments before next season; "high" means your soil is richly supplied; and "excessive" levels mean you need to balance out the soil. See "Adding Supplements" on page 11 for organic solutions to your soil imbalances.

Journey to the Center of Your Soil

The journey to the center of your soil starts with taking a sample to send for testing. To get accurate results, follow these simple steps.

1. Scrape off mulch or other litter from the surface of the soil. Use a stainless steel trowel or large spoon to lift out a wedge-shaped piece of soil about 6 to 8 inches deep. Set this aside in a stainless steel or plastic bowl.
2. Scrape 2 to 3 tablespoons of soil from the side of the hole. Keep roots, twigs, and other debris out of the sample.
3. Clear the soil surface, dig holes, and collect soil from 10 to 15 other spots in the area to be tested.
4. Mix all the soil you've collected. This mixture is the sample for testing.
5. Pour the soil from the bowl into the bag or box provided by the testing service for shipment to the lab. Fill out the paperwork and send it all off.



pH

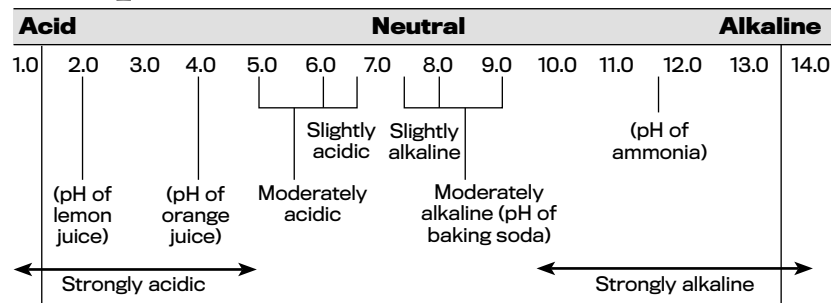
pH is a measure of your soil's acidity or alkalinity. A pH reading of 7.0 is neutral; numbers higher than 7.0 indicate that your soil is on the alkaline side of neutral, while numbers below 7.0 indicate acidity. If a soil is extremely alkaline, it doesn't matter how rich in nutrients it is because growing plants can't absorb nutrients in an alkaline soil. Most garden crops grow best in a soil that is neutral to slightly acidic (pH between 6.2 and 7.0).

If you garden in the Eastern United States, your soil may be too acidic. Heavy rain washes

Solvita Soil Breathalyzer Test

Good soil breathes much like we do. A home soil test kit analyzes your soil's "breath" by using a special gel that changes color when exposed to varying amounts of carbon dioxide. The more carbon dioxide, the healthier your soil. The Solvita Garden Care Kit, created by Woods End Laboratories in Mt. Vernon, Maine, allows you to test the life in your soil and recommends applications of compost rather than the synthetic chemicals that most soil tests promote. Call 800-451-0337 or visit solvita.com.

The pH Scale



The pH scale ranges from 1.0 (acidic) to 14.0 (alkaline). Most garden crops grow best between pH 6.2 and 7.0 (neutral).

away the calcium and magnesium in the soil that would keep the pH level close to neutral. In the Western United States, soils tend to be too alkaline because of the low rainfall. The alkaline elements build up in the soil instead of washing away.

Calcium (Ca)

This mineral is a major component of a plant's cell walls. Blossom-end rot (a black, decayed spot on the bottom of fruit), spindly plant growth, and closed leaves all may signal a lack of calcium. Acid, sandy soils along seacoasts are often low in calcium.

Magnesium (Mg)

Magnesium is an essential component of chlorophyll, which gives plants their green color and helps them turn sunlight into energy. When the amount of magnesium in your soil is in short supply, your plants will take supplies from their older leaves and move the

nourishment to their newer leaves, which need it the most, causing the oldest leaves to look yellow between the veins. These leaves may dry up and fall off. Magnesium can be deficient in sandy soils with an acid pH.

Nitrogen (N)

The amount of nitrogen your plants take in can make a huge difference in how much they yield. Too much nitrogen will give you big, lush plants with few fruits; too little will result in slow and stunted plant growth. Most soil labs don't include nitrogen as part of their basic test, because the nitrogen content of your soil can change dramatically from day to day and from season to season.

Some labs will tell you the "estimated nitrogen," based on the percentage of organic matter in your soil: productive soil should contain higher than 3% organic matter. This is a good long-term indicator of how much nitrogen will

eventually be available to your plants as that organic matter breaks down and releases the nitrogen in a plant-edible form. Symptoms of a deficiency of soil nitrogen are pale older leaves, or plants with stunted growth.

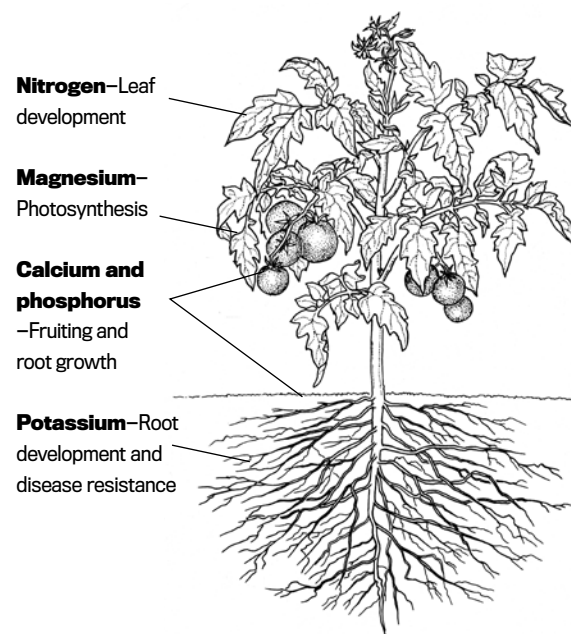
Phosphorus (P)

Phosphorus is crucial to the health and growth of plants. If your soil is deficient in phosphorus, the growth of your plants could be stunted. Unlike most other nutrients, phosphorus doesn't move freely through the soil, so plants with small or shallow root systems and root crops such as turnips and radishes are most affected by a lack of this nutrient; their roots can't extend far enough to reach the little bits of phosphorus actually in the soil.

Sandy or shale soils that don't contain much organic matter—a common occurrence in the Southern and areas of the Western United States—are often low in phosphorus. *Note:* Some labs will give you a reading for "phosphate" or " P_2O_5 " instead of phosphorus. This simply refers to phosphorus in combination with oxygen and hydrogen, the form in which your plants take up this nutrient.

Potassium (K)

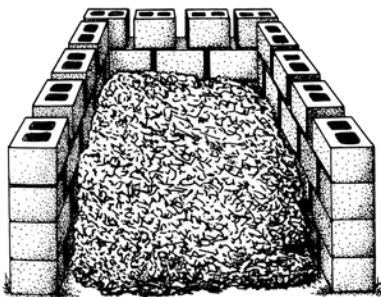
Potassium helps plants resist disease, strengthens their stalks, and improves the quality of their fruits and seeds. Lack of potassium can cause the older leaves on a plant to look burned, the growth of the plant itself to be stunted, and the fruit to be of poor quality—especially if



Nutrients and Plant Growth: To ensure proper leaf development, food production, and fruit and root growth, give your plants the nutrients they need.

Bulking Up Organically

Only organic products nurture the soil food web. Your plants and soil need more than just nitrogen (N), phosphorus (P), and potassium (K) to live and thrive. Your soil needs carbohydrates, cellulose, and other organic matter found only in compost, mulch, and some organic fertilizers. These nutrients feed the bacteria, fungi, earthworms, and other creatures that make the dirt rich and fertile. Do your garden a favor and feed it with compost and mulch. (See page 14 to learn more about the helpful critters in your garden.)



the plant is in the bean family. When it comes to a lack of potassium, beans are the first crop to suffer. If your beans have dead or dying older leaves and are giving you poor yields, lack of potassium may be the culprit. Low potassium can also result in small, misshapen tomatoes that don't keep well after picking.

Sandy soils containing little organic matter are often low in potassium. And a potassium deficiency can be aggravated during dry weather. Roots can't move as freely through dry soil to find the scarce amounts of potassium that are present. *Note:* Some labs will give you a reading for "potash" or "K₂O" instead of potassium. Again, these other terms refer to potassium in combination with oxygen.

Salts (Na)

If your garden is in an area where excess salts can be a problem, your local labs will test for them (this

situation usually occurs in the West). One of the tests measures the capacity of waterlogged soil to carry an electric charge; this corresponds to the level of dissolved salts in that soil. If you see something called "electrical conductivity" on your report, don't worry—it's about salt, not your electric bill! Do worry if your reading is high, however. The salts harm your plants both indirectly, by absorbing water the roots need, and directly, by damaging or killing the roots.

Sulfur (S)

Sulfur is a major component of all living organic matter, so it's no surprise that soils low in organic matter are also frequently low in sulfur. Sulfur is needed for the formation of amino acids and proteins in growing plants. In addition, nitrogen needs to have enough sulfur around to do its job of feeding those plants.

Adding Supplements

So you've taken the soil test—now what? Dozens of fertilizer products sit temptingly in garden centers, promising "bigger yields," "more flowers," or "miracle growth." Surely you should buy one or two of them to help your garden, right? Wrong. The truth is, you often don't need fancy fertilizers or special products of any kind for a successful organic garden. Overfertilizing, even with organic products, can disrupt soil mineral balances, stunt or burn plants, and make gardens more susceptible to pest problems. Also, excess nutrients can damage soil life and eventually leach away, adding to already serious water-pollution problems. So, before you buy and apply, here's a full

rundown of the best sustainable ways to fertilize your crops.

Start with compost. Compost is your first-choice fertilizer because it's the best food for your soil and crops. It is also the most sustainable, environmentally friendly option. Since it's bulkier than other fertilizers, you apply it in larger amounts—but it's the only material that provides large amounts of carbohydrates, as well as nitrogen (N), phosphorus (P), potassium (K), and many other nutrients, to feed what scientists call the "soil food web."

Each spring, apply a ¼- to ½-inch layer of compost to all your beds. (In very sandy soil or in the deep South, where organic matter is rapidly depleted, use double this amount.) Adding more than this is fine for the first few years as

Getting Your Nitro

Nitrogen is the most important nutrient to watch. Gardens usually need large amounts, and it is easily lost through rain or irrigation runoff. In fact, every 100 square feet of food garden uses approximately ⅓ pound of nitrogen per season. Here are three organic ways to get your nitro.

1. Backyard compost. A ½-inch layer will provide 15% of its nitrogen the first season; the remaining 85% is stored in the soil food web and released gradually as needed. You often won't need any other fertilizers after you've applied compost for several seasons.

2. Fresh grass clippings. Grass is a very rich source of nitrogen and other nutrients. Usually, just a ½-inch layer of fresh clippings mixed into the soil or a 1- to 2-inch

layer of surface mulch clippings will provide plenty of nutrients for a full season of growth.

3. Other organic fertilizers. Store-bought organic fertilizers contain varying amounts of nitrogen. Look at the first number on the label for the amount. For each 100 square feet of garden, use about 10 pounds of a product with a nitrogen content of 3% (alfalfa meal) or 5 pounds if the nitrogen content is 6% (soybean meal).

Premium Organic Fertilizers

The following materials are handy organic fertilizers that you can use if a soil test indicates your garden soil is deficient.

- **Alfalfa** is a leguminous plant with a fairly balanced NPK ratio and many other essential plant nutrients. It is an excellent all-purpose fertilizer and is most often sold in farm or pet stores as pelleted animal feed or hay.
- **Bat or bird guano** is dried manure deposits from bat caves or seabird colonies. It is usually highly soluble and therefore not a top choice. Also, harvesting may not be regulated to prevent harm to active bat or bird colonies.
- **Blood meal** is a relatively expensive source of highly soluble nitrogen. Never apply more than ½ pound per 100 square feet.
- **Bonemeal** is a good source of phosphorus. Use it if a soil test indicates levels are low. Since phosphorus does not readily leach down into soil, phosphorus fertilizer should be mixed thoroughly into the soil.
- **Fish products.** Many fish-based products are available in both powdered and liquid forms. They are usually rich in nitrogen and also have fair amounts of other nutrients.
- **Greensand**, also called glauconite, is a natural mined mineral with a potassium content of up to 7%. It's a good slow-release source of potassium, although potassium deficiency is rare when soils receive regular applications of compost or grass clippings.
- **Gypsum (calcium sulfate)**, a rich source of calcium and sulfur, does not raise the soil pH the way limestone does. It can improve the texture of some heavy soils, but use only if indicated by a soil test. (Avoid gypsum made from drywall scraps or other industrial by-products because it may contain toxic contaminants.)
- **Kelp meal** is made from ground, dried seaweed and is a good source of potassium and many trace elements. Liquid kelp products are also available, sometimes blended with fish products for a more balanced nutrient content.
- **Limestone (calcium carbonate)** provides calcium; dolomitic limestone also provides magnesium. Limestone is often used to increase pH, but a soil test should be done to determine appropriate application rates.
- **Phosphate rock** is a mined material with a total phosphorus content of up to 30%, although fertilizer labels usually list only the available phosphorus content, which is around 3%.
- **Soybean meal** is a fairly balanced, nitrogen-rich fertilizer. Unfortunately, it may now come from genetically engineered herbicide-resistant soybeans.
- **Sulfate of potash magnesia**, also called langbeinite, is a mined mineral rich in both potassium and magnesium. Because of its potency, it is most commonly found as an ingredient in blended organic fertilizers.

you build the fertility of new gardens, but compost releases nutrients very gradually, so you'll soon have ample nutrients stored in your soil. If you don't have the time or the materials to make enough compost, you can get more at your local yard-waste composting site, usually for free, or buy bulk or bagged compost from a garden center. (See "Begin Making Compost" on page 19 for more information on cooking or buying your own compost.)

Apply organic mulches. In addition to controlling weeds and conserving water, mulches such as grass clippings, leaves, or straw provide nutrients as they decompose. In fact, mulching is really an easier, more natural way to return nutrients to the soil than composting. In addition to releasing a slow, steady supply of nutrients, mulches protect the delicate creatures in the soil food web from harmful ultraviolet solar radiation. Look around in the woods and fields: Mother Nature never leaves the soil bare. Only when we cultivate it do we expose the soil directly to sunlight.

Those bags of grass clippings your neighbors leave out at the curb are actually a superb mulch and balanced fertilizer, all in one. (Just make sure the clippings come from lawns that haven't been treated with pesticides or chemical

fertilizers.) Fresh clippings start to break down very quickly, so always spread them immediately, in thin layers of up to 1 inch, to keep them from matting together. They're rich in nitrogen and especially effective with peppers, tomatoes, and eggplant.

Plant cover crops. Whenever a vegetable crop is removed from a planting area, sow a cover crop. Often called "green manures" when grown to boost soil fertility, cover crops convert solar energy into carbohydrates to sustain the soil food web. As the crop grows, 20 to 40% of the carbohydrates it produces is released through the roots into the soil, stimulating the growth of soil organisms and making nutrients available so the crop can continue to grow. (See "Grow Your Own Fertilizer" on page 35.)

Use other organic fertilizers only if needed. If you use compost and mulches, you may not need to use any other fertilizers. Nitrogen is the nutrient most likely to be in short supply. See "Getting Your Nitro" on page 11 for additional information on monitoring and replacing nitrogen. A soil test every few years will tell you if anything else is needed, and then you can choose a fertilizer that will provide the right amounts of the best nutrients.

Find Friends in the Soil



Your soil is a neighborhood full of bugs: Some you can see and some you can't. And, just like in your own hometown, there are bad neighbors and good neighbors. Unfortunately, the bad neighbors attract quite a bit of attention while the good neighbors usually go unnoticed. When you use a toxin to annihilate your aphids, you're making the deadly mistake of possibly killing off some other beneficial bug who might have eaten the aphid and saved you the risk and cost of using a pesticide. Call all those good neighbor bugs to arms! Put the creatures to work, and you might be surprised at the results.

Earthworms

We take earthworms for granted because most of their work goes on out of sight, deep within the soil. Even Darwin underestimated these lowly creatures; after years of careful calculations, he figured an acre of good soil could hold around 60,000 earthworms. Today, worm-counters say there are actually about 1½ million per acre.

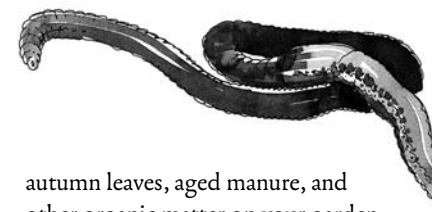
What's this seething mass doing beneath the soil? Lots of good stuff. In a year, an acre of worms can move 20 tons of earth. Simply by tunneling through the soil, worms break up compacted earth so air and water can circulate more freely. But the worms' eating habits are what make them so great for the garden. They chow down on dead leaves, bits of soil, rotting plants, and other nourishing debris, grinding the material in their gizzards. What comes out the other end is a magical elixir that increases the amount of nutrients and minerals in the soil by as much as 10 times the value of the plant debris originally there. Worm droppings, known as "castings," are the richest food your plants' roots will ever find. In a decade, castings can add an inch of fantastic new topsoil. Worm action also creates great soil texture.

As the worms turn raw organic material into humus, the soil becomes moist, loose, and more like ideal loam.

Depending on the species, an individual worm may live as long as 15 years; however, with all the dangers of the natural world, few survive that long. Don't worry, though, that moles or robins will decimate your worm population. As long as you keep dumping grass clippings, chopped

Encourage the Worms

Earthworms are indicators of healthy garden soil. If earthworms are scarce in your soil, it could mean your soil is compacted or low in organic matter, or that it has been treated with pesticides. If you do nothing more than lay down chopped leaves and grass clippings over your existing garden soil, you will see an increase in worm activity.



autumn leaves, aged manure, and other organic matter on your garden, your soil will be enriched by throngs of little earth-movers for years to come.

(For more on earthworms, see "Earthworms: Professional Compost Chefs" on page 29.)

Other Friendly Soil-Dwellers

The earthworm isn't the only good neighbor you have hiding under the topsoil in your garden. There are tons of crazy creatures that help your garden grow. Some are large and might be mistaken for bad neighbors if you aren't looking closely, and others are so small you can't see them at all. Let these friendly soil-dwellers work for you, and you'll have great humus with almost no work.

How Earthy Creatures Give Back

Actinomycetes are bacteria that grow in long, thin chains in the soil. They produce the unique, earthy smell that's a sure sign of rich soil—and they actively suppress many plant diseases.

Bacteria are neither plant nor animal—scientists have created a third “kingdom” just for them. These single-celled organisms “glue” soil particles together, make nutrients more available, hold plant-feeding nitrogen in place, and degrade pollutants.

Earthworms act like itty-bitty plows, feeding on soil microbes and organic matter and releasing nitrogen as they tunnel through and mix up the soil.

Fungi are “decomposers” that help to break down organic matter to create better soil.

Mites, springtails, pillbugs, and other insects and arthropods feed on fungi, release nitrogen, and help bacteria, organic matter, and fungi increase the water-holding capacity of your soil.

Nematodes are microscopic, wormlike, soil-dwelling creatures. Most species are beneficial, eating bacteria and fungi and releasing plant-feeding nitrogen. Some species are destructive, but in compost-rich soils, the good nematodes will help keep the bad guys in check.

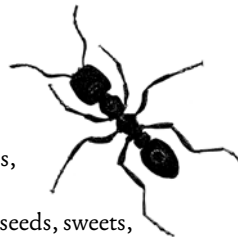
Actinomycetes

Despite their long name, actinomycetes are simply a higher form of bacteria, similar to mold or fungus. They are especially important in the formation of good soil and give it that characteristic earthy smell when it's tilled in the spring. While most bacteria are found in the top foot or so of topsoil, actinomycetes may work many feet below the surface. They convert dead plant matter to a peatlike substance deep under the roots.



Ants

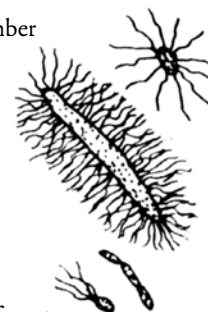
Ants feed on a variety of materials, including aphid honeydew, fungi, seeds, sweets, scraps, other insects, and sometimes other ants. Their everyday movement can make soil richer in phosphorus and potassium because they move minerals from one place to another as they go.



Bacteria

When we hear about them on the television and radio, bacteria are usually associated with contamination and illness. But harmless and beneficial

bacteria far outnumber the bad. Bacteria specialize in breaking down organic matter and are essential for healthy soil. They are single celled



and come in all different shapes and sizes—spheres, rods, and spirals. They are so small that it would take 25,000 bacteria laid end to end to take up 1 inch on a ruler, and an amount of garden soil the size of a pea may contain up to a billion bacteria. They eat almost anything and help break down large pieces of organic matter, such as shredded leaves, into humus. Since bacteria are small and not very mobile or complex, it doesn't take much to kill them.

Beetles

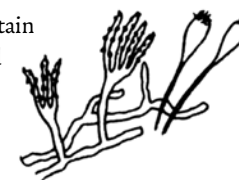
Some beetles feed on fungal spores, some on insects, and others on your plants. Most adult beetles feed on decaying vegetables, but some, like rove and ground beetles, prey on snails, insects, and other small animals. Beetles are easily identified. They have two pairs of wings, an upper set that creates a shield, and a folded, thinner back set used for flying. Some gardeners import beetles when slugs become a problem.



Fungi

Fungi are primitive organisms—kind of the Neanderthal men of the plant world.

They don't contain chlorophyll and can't make their own food. They live on organic matter, breaking it down and creating better soil.



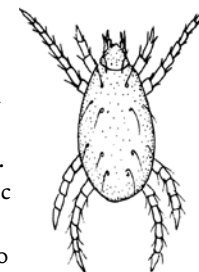
Millipedes

The wormlike body of a millipede has many segments, and each, except for the front few, bears two pairs of walking legs. The life cycle of the millipede is fairly mysterious. Eggs are laid in the soil in springtime and hatch into small worms. Young millipedes molt several times, finally growing their full array of legs. When they reach maturity, adult millipedes can grow to a length of 1 to 2 inches and help break down plant material by feeding on it.



Mites

Mites are related to ticks, spiders, and horseshoe crabs. All have eight leglike jointed appendages. They can be parasitic (or not), and some mites are invisible to the naked eye. Mites reproduce rapidly. They attack plant matter, helping it to decompose. Some mites also eat nematodes, fly larvae, other mites, and springtails, keeping the populations in check.

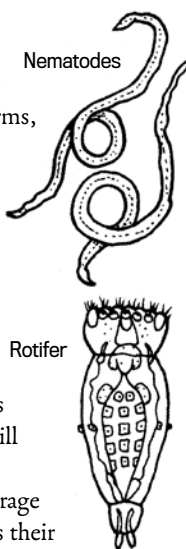


Nematodes, Flatworms, and Rotifers

Nematodes, or eelworms, are microscopic creatures that may live on decaying organic matter; prey on other nematodes, bacteria, algae, and protozoa; or attack roots of living plants. Keeping your garden's nutrients in balance will help to encourage the good kind and discourage the bad. Flatworms, as their name implies, are flat organisms that are usually microscopic in their free-living form. Most flatworms are carnivorous and feed on other soil-dwellers. Rotifers are small, round animals that are divisible into three parts: head, trunk, and tail. They feed on microorganisms and keep the bacterial and fungal populations in check.

Protozoa

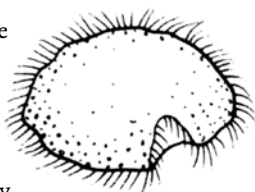
Protozoa are the simplest forms of animal organisms; they are single celled and microscopic in size. Still, they are



larger and more complex than most bacteria.

A gram of soil can contain as many as a million protozoa.

Protozoa work in the same way as bacteria, breaking down organic matter, and are also important for good soil.



Spiders

Spiders, which are related to mites, are the most underappreciated forms of life in the garden. These eight-legged creatures feed on insects and small bugs, and they can help control garden pests. Although some find spiders to be creepy, the spiders' benefits far outweigh their bad reputation.

Begin Making Compost

pg
19



Compost—a simple “man-made” imitation of how Nature has fed breathtaking forests and fields of wildflowers for eons—is an excellent fertilizer, a superb soil conditioner, and a protection against drought and disease. This fabulous substance, essential to a great organic garden, is easy to make and guaranteed to give you abundant yields of food and flowers. Every gardener knows that compost is the gold of the gardening world. The finished product—that rich, dark humus—is even called black gold. But, if it is so wonderful and beneficial, why isn't everyone using it? Have you ever found yourself saying the following? “It takes too much time.” “It's hard work.” “It stinks.”

Composting doesn't have to be a pain in your weekends. Once you have the basics down, you can use some quick cooking techniques for faster compost.

Home-Cooked Compost

By making your own compost pile in the backyard, you can control what goes into your compost and, therefore, what goes into your soil. And home-cooked compost doesn't have to be difficult or smelly. If you add the right ingredients and follow the recipe, you'll be a professional compost chef.

Ingredients

Materials for composting are all around you. Many gardeners don't have to look any further than their own home for an adequate supply. That watermelon rind from last night's picnic, those eggshells from this morning's breakfast, lawn clippings, weeds and plant debris, vacuum-cleaner dust—nearly anything that once lived—all are candidates for the compost heap.

Are you discarding any organic matter? Vegetable scraps, newspapers, tea bags, coffee grounds? If you've exhausted the home supply and still don't have all the compost materials you would like, plan some foraging expeditions, beginning as close to home as possible and ranging out as

far as you need to in order to answer the call of the compost.

Don't be afraid to ask neighbors, friends, and relatives. Most people enjoy feeling that they're helping the environment. In fact, by collecting materials for your compost, not only will you be helping your soil, but you'll also be recycling garbage that might have been shipped off to an already overextended landfill. Sometimes communities offer free leaves or shredded tree limbs to anyone who'd like them. Supermarkets and restaurants may also be willing to contribute their old or leftover organic materials to you. You have to be careful with materials from unknown sources, though. You wouldn't want to compost grass that has been treated with pesticides or herbicides.

Bananas

The skins and stalks of this tropical fruit are full of phosphoric acid and potash. Banana skins also decompose rapidly. They're usually a staple in kitchen scraps, and adding them to your compost heap will guarantee lots of bacterial action. Dump banana skins



The search for compost materials begins at home.

It's Alive!

A single teaspoon of fertile soil that has received regular additions of compost contains an unbelievable 100 million bacteria, plus an astonishing 400 to 800 feet of fungal threads, and millions of other microbes. Soils that have received only conventional chemical fertilizers typically contain drastically lower numbers of beneficial living creatures. Some soils farmed repeatedly with chemical fertilizers are almost dead, with only 100 bacteria per tablespoon.

into the center of your pile or cover them with existing compost or soil to keep the flies away.

Coffee Grounds

Earthworms just love coffee grounds. They can't get enough of the all-powerful java, so make sure you toss these leftovers on the compost pile. Start your very own earthworm coffeehouse! The grounds are also great for your soil, even without the

earthworms' help. They're acidic and can be used by themselves around blueberries, evergreens, and other acid-loving plants. For other plants, balance out the acid in coffee grounds with other materials in your compost pile. Drip coffee grounds have more nutrients than boiled grounds.

Grass Clippings

Most gardeners have a continuing supply of this compost material—

considered a true green manure. It is rich in nitrogen and will heat up well in a compost pile. Add grass clippings in thin layers, alternating with other dry materials to prevent clumping. Only collect grass clippings from neighbors or friends if they haven't used chemical fertilizers or pesticides on their lawns.

Kitchen Scraps

Kitchen scraps are truly a neglected resource, containing nitrogen, calcium, phosphorus, potassium, and micronutrients. When adding kitchen scraps to

your compost pile, mix them well with something absorbent such as dead leaves or hay, and be sure to cover them with soil or finished compost to keep the flies away. Some common compostable kitchen scraps are: vegetable scraps, fruit scraps, coffee grounds, tea bags, and eggshells. Remember: no meat or dairy!

Leaves

Most leaves contain twice the mineral content of manure. Compost them fresh, and grind or shred them before adding them to the pile. They'll decay in

No-No Compost Materials

The following items should never be added to compost because they could introduce harmful pathogens, toxins, and nonbiodegradable materials.

Black walnut leaves, bark, and chips contain juglone, a chemical that inhibits the growth of many plants, especially tomatoes.

Diseased plants must be disposed of in the garbage or burned. Adding them to compost could spread the disease.

Dog, cat, cow, pig, and reptile manures (and associated bedding) may contain parasites or dangerous pathogens that are harmful to humans, particularly children, pregnant women, and people with compromised immune systems.

Gypsum board scraps could contain paint and other undesirable toxins.

Materials from the side of the road, including grass clippings and leaves, could contain petroleum residues, toxins, and nonbiodegradable materials.

Meats, dairy products, bones, and fish smell, decompose slowly, and attract animals.

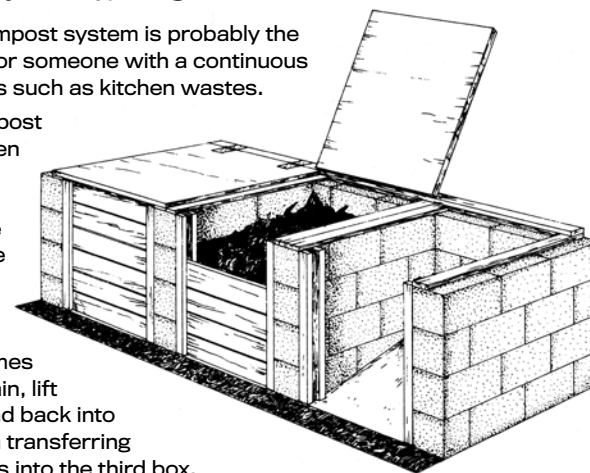
Paper, especially glossy paper printed with colored ink, may contain heavy metals. Black-and-white newspaper is safe.

Vacuum cleaner bag contents may contain synthetic carpet fibers and other nonbiodegradable items.

Compost in a Box

This three-box compost system is probably the most convenient for someone with a continuous supply of materials such as kitchen wastes.

Start your compost in the left box. When it is time to turn the pile, simply lift it over the edge and into the middle box. Transfer any finished humus into the right box. When the time comes to turn the pile again, lift it over the edge and back into the first box, again transferring any finished humus into the third box.



just a few weeks or months if you add extra nitrogen to your pile. You can also simply pile the leaves in a chicken-wire cage to make leaf mold, a terrific amendment for ornamental beds.

Manure

Chicken and horse manure will add nitrogen to the compost pile. Chicken also adds phosphorus, and potassium. You can compost manure from pet rabbits, gerbils, and hamsters right along with wood or paper bedding. Manure should be in a cold compost pile at least a year before it's used and in a hot compost pile at least 6 months.

Newspaper

Newspaper can be recycled in more than one way. Add it to your compost pile for valuable carbon. The secret to using paper is shredding it. Like leaves, the

shredded paper should be worked into the compost in layers alternating with other wet compost materials. Also like leaves, paper requires more nitrogen in the pile to decompose effectively.

Pine Needles

Pine needles are compostable but shouldn't be used in large quantities. They break down rather slowly because of their thick, waxy outer layer. They are also acidic. Unless you are creating a specific pile for acid-loving plants, keep pine needles to a minimum.

Sawdust

Sawdust is a great bulking agent—it allows air to penetrate the compost pile, which helps the process of decomposition. Because sawdust is so high in carbon, it requires extra nitrogen to help it decompose. Although it takes sawdust

a long time to break down completely, small pieces that may remain in finished compost will improve the texture of your soil. Be careful where you get your sawdust. Make sure it is not from particleboard, plywood, or any other chemically treated lumber.

Seaweed

Coastal gardeners have a rich source of compost materials right on nearby beaches. Seaweed is full of micronutrients and can boost the health of your compost, soil, and plants. Seaweed in general has an organic content that's similar to manure but with more potassium and less nitrogen and phosphorus. Seaweed is most valued, though, for its micronutrient content. An analysis of the seaweed most commonly used found some 60 elements. Compost seaweed when it's wet and fresh, and mix it with absorbent, nitrogen-rich materials for rapid decomposition.

Soil

While not a necessity, soil is a valuable material in compost making. Soil contains organisms (see "Other Friendly Soil-Dwellers" on page 15) that break down organic materials, as well as minerals and organic matter that will help activate the pile. The layers of dirt in a compost heap absorb unstable substances produced by fermentation and help keep heat and moisture from escaping.

Straw

Straw will bulk up a pile. Each straw stalk lends itself as a conduit for air to circulate. Don't confuse straw with hay, which often contains weed and grass seeds and shouldn't be added to compost. You can get straw from your local garden center or a farmer.

Wood Ash

Wood ash is a valuable source of potassium for the compost pile but

Layering Around

Layering items in the heap is an easy way to let air circulate through the compost. Layer poles into a heap and pull them out every few days or so. Sunflower stalks also make great layering material. They have soft centers that rot out quickly to create organic "pipes" that increase the airflow. When making or adding to your pile, follow these steps to easy air circulation:

1. Make a base of sunflower stalks 2 to 4 inches thick.
2. Top with 12 inches of compost material, followed by ¼ inch of soil.
3. Add a few more stalks, another layer of compost material, and another ¼ inch of soil.
4. Continue the layers until the pile is about 4 feet high, finishing with a 2-inch layer of soil.

So-So Compost Materials

Many things found in the average home are nontoxic and biodegradable and come from a known source—but they aren't great compost ingredients because they break down slowly, mat together, and don't add many nutrients.

Cardboard must be shredded or chopped into small pieces if you're adding it to the compost pile.

Dryer lint may contain synthetic fibers that will never decompose. Even natural-fiber lint adds no benefit to compost.

Human and pet hair can be added in small amounts if you keep in mind that it breaks down slowly, mats easily, and sheds water.

must be used cautiously. It is a strong alkalinizing agent and also increases the salt content of the soil, so be careful not to create a nutrient imbalance by applying too much. If you want to add potassium, use no more than a dusting of wood ash on each layer of the compost pile.

Wood Chips

Like sawdust and other wood wastes, wood chips are useful in the garden. In some ways wood chips are better than sawdust as they contain a greater percentage of bark and have a higher nutrient content. They break down slowly, so their high carbon content is less likely to reduce the nitrogen levels. Because wood chips take such a long time to break down, you may want to compost them separately instead of adding them to your regular pile.

Basic Compost Recipe

There are many ways to let nature make compost for you—under the ground,

above the ground; in bins, boxes, pits, bags, and barrels; in strips, sheets, trenches; in 14 months or 14 days; indoors or outdoors. Nearly all of the techniques have the same basic requirements: air, moisture, food, and warmth. Although you can use fancy techniques and tools, as long as you keep the basic requirements in mind, you'll create moist, fragrant, fertile compost.

Start with air. Although it is possible to make compost without air, or anaerobically, most home composting systems are aerobic and require adequate air to help the pile decay. Without air, many beneficial bacteria can't survive to create life in your pile. The most common method for encouraging air in the compost is to turn the pile at regular intervals. The more air you encourage in your compost pile, the faster the pile decomposes—so the more frequent the turning, the faster the raw materials will become dark humus. Burying perforated drainpipe

at regular intervals within the pile will pull air through the pile by natural convection.

Moisture is the second component in the compost recipe. Good compost will be about as damp as a moist sponge: When a handful is squeezed, no drops of moisture should come out. Too little moisture slows down decomposition and prevents the pile from heating up. Those good microorganisms also need a steamy environment. Too much moisture, signaled by a foul odor and a drop in temperature, drives out air, drowns the

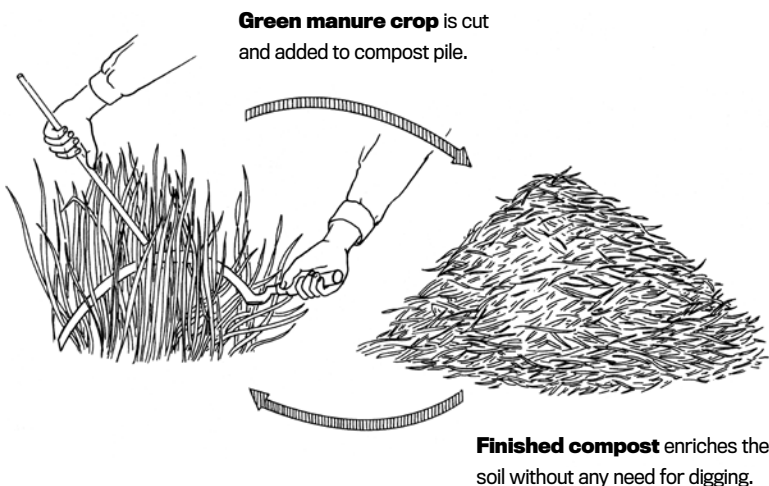
pile, washes away nutrients, and kills all those beneficial bugs.

Make sure the site you choose drains well so your pile never sits in a pool of water. In hot, dry areas, you may have to sink the pile into a shallow pit to help trap moisture. Check the moisture content when turning your compost pile. If the pile is soggy, add more absorbent materials such as leaves or dried grass clippings. If it is dry, give it a good sprinkling of water every 6 to 8 inches.

Strange as it may sound, your compost pile needs food. And we're not talking kitchen scraps. The

Compost Crops

Get the nutrients of a cover crop without all the tilling and digging—plant a compost crop! Sow the seed and then harvest the mature crop before it sets seed. Either pull the crop out by hand, or use a scythe or sickle to cut it off at the surface. The remaining roots will decompose in the soil, supplying organic matter, and you can add the clippings to your compost pile for a nutrient boost. (See page 35 for cover crop information.)



Some Like It Hot

Hot composting is the fastest way to get from garbage to black gold. Even gardeners in cooler areas can make six or more batches of compost in one season. But, as with everything, there are pros and cons to using a hot composting method. (See "The Cold Compost Method" on page 28 for another composting alternative.)

Pros

- Produces finished compost quickly
- One pile is space-efficient
- Provides instant fertility for a new garden
- Kills most weed seeds and harmful bacteria

Cons

- Is labor-intensive
- Moisture and the carbon/nitrogen ratio need to be carefully monitored
- Best built all at once, requiring multiple piles or storage of kitchen wastes until beginning a new pile
- Produces compost with less ability to suppress diseases in the garden soil

decomposers that break down the materials in the pile need carbon for energy and nitrogen for growth. The ideal carbon-to-nitrogen ratio is about 30 to 1. Measuring this ratio precisely is unnecessary—with a little experience you will figure out what materials make for the best combination.

Generally, carbon is supplied by brown or yellow, dry, coarse, and bulky materials. High-carbon-monoxide materials, such as cornstalks, leaves, sawdust, and straw, almost always come from the plant world. Nitrogen, on the other hand, is supplied by green, succulent, gooey, and dense materials. In the past, nitrogen was added to a pile in animal by-products, but with concerns over *E. coli*, more and more gardeners are turning to plant sources. Some high-nitrogen materials are alfalfa meal, blood meal, grass clippings, and poultry manure. Fresh clover and most kitchen

garbage have ideal carbon-to-nitrogen ratios all in one source.

A balance of carbon and nitrogen is essential to the health of your compost pile. A pile with too much carbon will still break down, but it will take a very long time. A pile with an overabundance of nitrogen will also break down, but you might have to hold your nose to even get close to it. The number-one offender when it comes to a smelly compost pile is nitrogen. Rather than being used by the pile, the excess nitrogen escapes into the air as ammonia. Usually, an imbalance will last only a day or two until the pile can stabilize itself.

Warmth will make speedy work of a compost pile. All those good bugs and bacteria work their best in a warm compost pile. Remember that the center of the compost pile will be the warmest and the temperature will

decrease toward the outside, so turning is of utmost importance. When turning, shovel the undigested materials from the outside of the pile into the middle and vice versa. To keep the pile working constantly, a three-box system is handy (see “Compost in a Box” on page 23).

So what happens to the hot compost pile in winter? Bacteria become dormant when the temperature drops below 55°F, but, if properly built, your compost pile’s insides will stay well above that temperature even in freezing weather. Northern United States gardeners sometimes insulate their piles with leaves or straw to keep things cooking. Decomposition will certainly slow down

in the winter, but a pile built in the fall and kept covered should be finished and ready to use in spring.

Almost-Instant Compost

In a world of fast food, fast cars, and fast communication, we’re looking for faster ways to do just about everything, including composting. The fun part of gardening is the actual gardening. Who wants to wait for that orange peel to oh-so-slowly turn from orange to brown, to black, to moldy, and so forth, before planting peas? Learn how to make instant compost, and you’ll be digging in the garden in no time.

The Cold Compost Method

Cool composting is the easiest way to get from garbage to gold. Letting Nature take care of working the compost for you saves work and energy on your part. But, as with everything, there are pros and cons to using a cool composting method. (See “Some Like It Hot” on page 27 for another composting alternative.)

Pros

- Needs little maintenance
- Encourages disease-suppressing microbes
- Holds on to nitrogen
- Allows materials to be added a little at a time

Cons

- Allows nutrient loss through rain, sun, and wind exposure
- May take 6 months to 1 year to produce finished compost
- Doesn’t kill weed seeds
- Needs the carbon/nitrogen ratio balanced each time something is added
- Final compost has more undecomposed pieces

Population Patrol

Try the following technique to keep your compost worms in the compost pile—exactly where you want them.

1. Remove the outer layer of the compost heap to expose the worms; set it aside. Since worms are repelled by light, they will retreat farther into the pile.
2. Wait 30 minutes to allow the worms time to settle into the new shape of the compost heap.
3. Remove the next layer for your garden and wait another 30 minutes.
4. Continue this process until you have removed as much compost as you want.
5. Place the reserved outer layer back onto the pile, as it probably isn’t finished composting.
6. Cover immediately with new organic materials.

Earthworms: Professional Compost Chefs

If you let them, earthworms will do most of your composting work for you, in the garden, on the farm, or even in your basement. So consider them your professional chefs, taking the raw ingredients from the compost pile and making them into a gourmet feast for your plants and vegetables.

Earthworms are amazing. They can consume their own weight in soil and organic matter each day. Then they leave behind castings, the richest and most productive compost. Castings contain from 5 to 11 times the amount of available nitrogen, phosphorus, and potassium as the soil the worms ate to produce those castings.

Earthworms will naturally be attracted to a compost heap, usually attacking it from the bottom. The cooler base layers at the bottom of the pile will soon be reduced in size and

start looking like humus. Field worms and night crawlers will quickly infiltrate this layer, turning and mixing the earth with the organic matter. They will also reproduce quickly, increasing their population many times over. If the heap is maintained for a year or more in one location, the earth below it will become rich and loaded with earthworms. Every time it rains, some of the nutrients from the compost leach into the soil. Earthworms will mix these nutrients into the surrounding soil and stabilize them for growing plants. This is a good reason to change the location of your compost pile every year or so. Plants grown where an old compost heap was built will flourish beyond what you might expect.

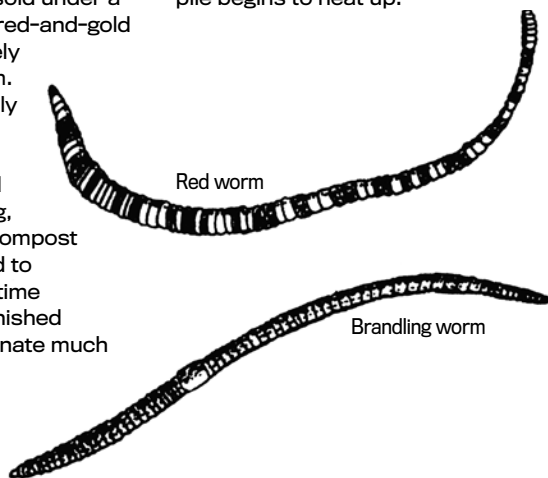
As the compost heap matures and the materials farther up the heap decompose, field worms will travel farther up the heap as well. Red or brandling worms will usually flood a heap from

The Right Worm for the Job

Red Worms (*Lumbricus rubellus*) and Brandling Worms (*Eisenia fetida*)

These are the species usually sold by earthworm breeders. They are commonly sold for fish bait as red wigglers, hybrid reds, Georgia reds, and so on. Any worm sold under a name that suggests a red-and-gold or banded worm is likely to be a brandling worm. The others are probably red worms. Neither species can survive in ordinary garden and farm soils for very long, but they will thrive in compost bins. They can be used to reduce the amount of time required to produce finished compost and can eliminate much

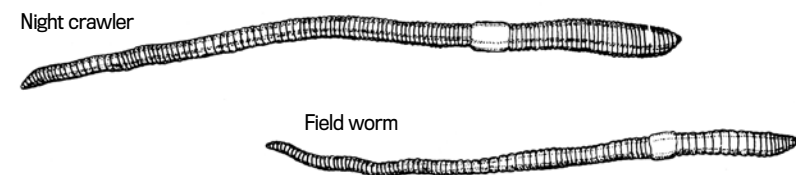
of the turning a wormless pile would need. However, most red and brandling worms will be killed off or driven away when the compost pile begins to heat up.



Field Worms (*Aporrectodea caliginosa*) and Night Crawlers (*Lumbricus terrestris*)

Both of these species will attack compost heaps from the bottom but prefer to retreat into the soil after having done so. They won't thrive in an active compost pile and are killed by the heating process more readily

than red worms and brandling worms (see above). Night crawlers demand cool soil temperatures and will not inhabit compost piles. If they are shoved into an active compost heap, they will die.



base to top, keeping away from the heated center, but field worms and night crawlers are more conservative about their travels. Night crawlers like cool temperatures and will feed only at the bottom of the heap.

Although red and brandling worms can work at higher temperatures than their field-living cousins, they will be killed in the intense heat of an active compost heap, where temperatures can reach 150°F. Introduce them only when the interior of the pile has cooled down. Normally this will be about 3 weeks after the last materials have been added to create a hot compost pile. At this point, dig holes at various points in the heap, and drop 50 to 100 worms in each. About 1,000 worms are perfect for a 4- x 6-foot pile. In a matter of days, the worms will be eating the organic matter, leaving their rich castings wherever they go, and reproducing prolifically.

Using your professional chefs in a cool compost pile is even easier. If you construct your heap so it is longer and wider rather than it is tall, you can create a cool compost pile to house tons of tiny earthworms. Shred all your materials if possible and introduce red or brandling worms immediately. They will go to work right away and the heap won't heat up greatly because of the large surface area; the center will be too close to the cooling surface and outside air.

House Worms: Invited Guests

Encouraging worms in your outdoor compost is easy all year round if you live in a warm-climate area. In colder

regions, you'll probably end up with wormcicles if you leave your compost chefs outside over the winter. The answer to this problem—house worms! Whether under the kitchen sink or in the basement, a worm box or bin to house and feed your worms in the cold months may be just what you need. Here are the steps to get you started.

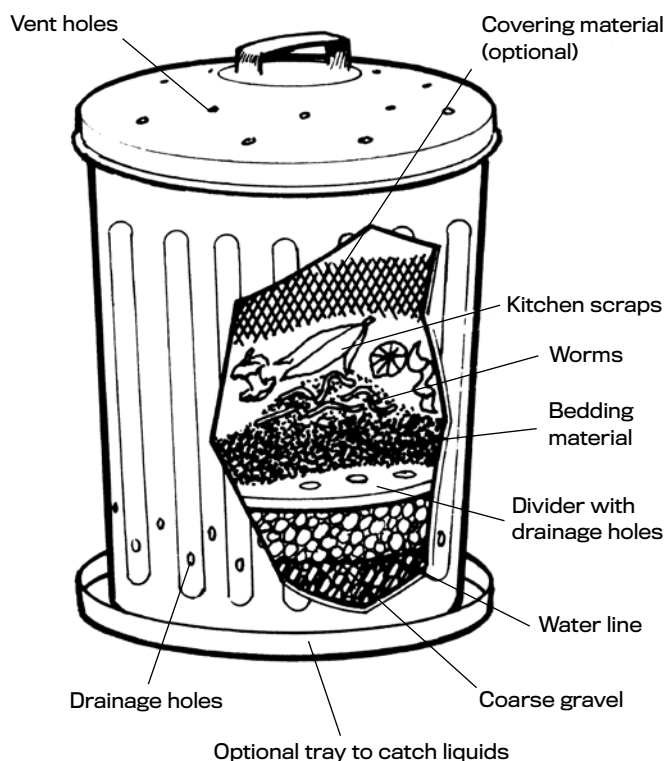
Choose a bin. A standard worm bin is a shallow wooden or plastic box about 1 x 2 x 3 feet. You can also use an old garbage can or even a large plastic storage container.

Add a lid. The lid keeps light and moisture out and the worms in. Form-fitting lids work best, but a black plastic sheet directly on top of the compost also keeps the bin dark and prevents the worms from drying out.

Aerate. Good circulation is key to an odorless bin. Drill approximately twenty ¼-inch air holes in the top and bottom. If you still smell an odor, add a few more air holes on the sides, and raise the bin on bricks or wooden blocks to increase airflow. Put a tray under the bin to catch any excess liquid.

Prepare bedding. Tear newspapers into thin strips, layer until the bin is ¾ full, and sprinkle on enough water to dampen the bedding. Scatter two handfuls of soil onto the paper to provide worms with grit, which aids digestion.

Locate bin. Place it in a convenient spot. Basements, garages, and heated



porches are good locations. Worms thrive between 55 and 80°F.

Order worms. Buy red worms (*Eisenia fetida* or *Lumbricus rubellus*). You'll need a ratio of 2 pounds of worms (1,000 wigglers) per 1 pound of food waste each week. A pound of wigglers costs about \$20.

Add food waste. Bury food scraps under the bedding. Rotate placement of food in different corners of the bin. Avoid meat and greasy foods that may rot and smell.

Harvest worm compost. After about 2 to 3 months, add new bedding

and food waste to one side of the bin. Worms gradually migrate to the food source, leaving rich compost on the other side, which can then be used on houseplants or in the garden.

Ready-Made Compost

Homemade compost is the best thing you can use to feed your plants, improve your soil, and recycle yard waste. But it seems as if there's never enough.

Make as much compost at home as you can and use it as soon as it decomposes to the point that you can no longer

recognize the original ingredients. If you just can't make as much as you need, grab a large garbage can or bin and head for your local yard-waste recycling center. If your city doesn't have a yard-waste composting site, you can sometimes save money by buying compost in bulk from garden centers.

Buying compost isn't as simple as looking for the best brand. Most commercial composts are produced and sold locally; you won't find the same products in South Dakota and Tennessee—or even in Nashville and Memphis. The quality of commercial compost varies just as much as the regions it comes from. Commercial composts are made from whatever local waste materials are available at the time. The contents of one "brand" will even differ from batch to batch depending on what materials were readily available when it was made. In fact, if you were to test a brand of commercial compost that scored at the top of the class one month, it might very well flunk out the next month.

How Much Is Enough?

People get the idea that they need to bury their gardens under truckloads of compost to get good results. However, in most areas of the country, less than a ½-inch-thick layer once a year is plenty to accumulate enough organic matter in the soil to provide ample nutrients for excellent plant growth.

Fortunately, a simple look (and sniff) can be all you need to find a good-quality product. Be a compost connoisseur. Your garden will thank you. Here's how to check out the texture, color, moisture, and "bouquet."

1. The texture should be loose and granular, with little or no recognizable wood or bark. If the compost isn't

What's the Difference?

Unlike homemade compost, which comes from a mix of kitchen scraps, garden wastes, grass clippings, and leaves, commercial compost is often based around a single material. A single ingredient doesn't usually compost properly unless other materials are added. Because these other materials take time and money, many commercial composters don't always add them.

It is much more difficult to maintain proper moisture and aeration in long commercial compost piles, which are often 8 feet tall and 16 feet wide, than it is in a 4-square-foot backyard pile. As a result, commercial compost piles that aren't carefully mixed and maintained can result in poor-quality products.

loose enough for you to spread and work into your garden beds easily, don't buy it.

2. The color should always be dark brown or almost black. Products that are too light in color are likely to contain too little organic matter and too much soil. It's easier to tell the true color if you let the compost sample dry out before you check the color.

3. Compost should be moist, not dry or soggy. One of compost's biggest benefits, once it's in the soil, is that it can hold up to 2½ times its weight in water. But in bagged products, excess moisture makes the compost difficult to spread. It also means that if the compost is sold in 40-pound bags (as most of them are) and you buy a wet product, you'll be paying for water, not compost. Lifting the bag will give you a good idea of its moisture content. If it feels like a big glob, the compost is probably too wet; if it feels loose, it is probably drier.

4. Ideally, mature compost will have a nice earthy smell, but this isn't a reliable test for bagged compost—at least not right away.

The plastic bags restrict the oxygen supply to the organisms that release the earthy odor. If you do find an earthy, woody odor, you've probably struck black gold—a mature, good-quality compost. Most bagged composts will probably have a slight musty or barnyard odor when you first open them, and that's fine. Avoid any products that have a strong, unpleasant smell. The scent of ammonia or sewer gas indicates immature compost that might damage plants. If you don't want to smell it, don't put it on your garden. Some stores may not let you inspect a bag before you buy it. If you take a bag home and find it's not up to these standards, either take it back or dump it onto your home pile to dilute and fully compost.

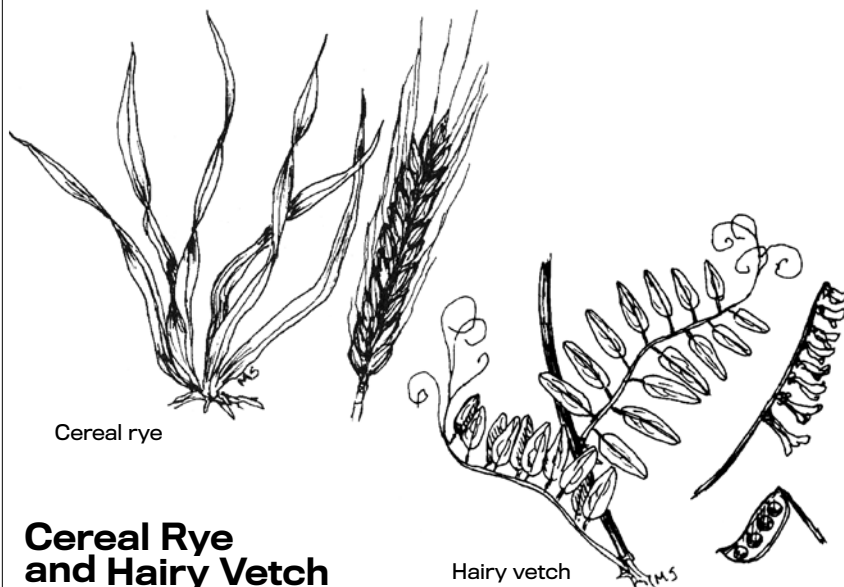
5. If you need a large amount of compost, it's probably worth your time to insist on seeing lab-tested results. Gardeners have a right to expect good-quality compost, fully tested and correctly labeled.

Keep your eyes open and your nose at the ready when buying bagged compost. It might be the fastest way to get black gold, but it is also the fastest way to get fool's gold.

Grow Your Own Fertilizer



As your garden's most valuable asset, the soil deserves your attention and protection all year round. With cover crops—a.k.a. *green manure*—you can build the soil's fertility, texture, and beneficial microbe population, as well as prevent weeds from taking over during the off-season. And you don't need to have a large plot or a degree in agronomy to use cover crops effectively. These five cover-cropping strategies work well in gardens of any size and under a wide range of conditions. Planting and turning under cover crops is a little extra work—though with a small tiller, garden fork, or shovel the job isn't too tough—but you'll be rewarded later on with less weeding and fertilizing, and soil that's a joy to work.



Cereal Rye and Hairy Vetch

A PERFECT PAIR

Cereal rye (*Secale cereale* L.) and hairy vetch (*Vicia villosa* Roth) are two crops that work together as soil-builders.

- Like other small grains, rye creates a dense groundcover quickly, complementing the vetch's slow initial growth and providing winter groundcover while the vetch begins to fix nitrogen.
- Rye's dense, fibrous root mass anchors soil to prevent erosion, while hairy vetch's taproot houses nitrogen-fixing soil bacteria, scavenges nutrients from deep in the soil, and carves passages in the soil for drainage.
- Rye complements vetch's high nitrogen content with carbon-rich material that will add organic matter when turned under.
- Rye is also allelopathic, which means it inhibits the germination of other seeds—reducing your weed worries. Allow it about 3 weeks to decompose

Hairy vetch

before planting your following crop.

Hardiness. Rye grows at low temperatures, making it convenient for fall planting. Hairy vetch is quite winter-hardy also, provided you choose seed that was grown locally, or north of your location. Rye shelters it from cold, while giving it a structure to climb for access to sunlight.

Planting. Plant about 1¾ pounds of rye and ¾ pound of hairy vetch per 1,000 square feet; then rake soil over it.

Turning under. Turn the crop under before the vetch flowers and the rye forms tough stems (after heading). However, the more growth you allow prior to flowering, the more nitrogen you'll get out of the vetch.

Oats

DIVERSIFY

"Cover crops from the grass family such as oats, rye, or sudangrass help diversify the rotations in the garden, since most of the crops we plant in the home garden are broadleaves," says Steve Zwinger, research specialist at North Dakota State University.



Oats

Soil tolerance. Oats (*Avena sativa* L.) are tolerant of wet, heavy, and poorly drained soils.

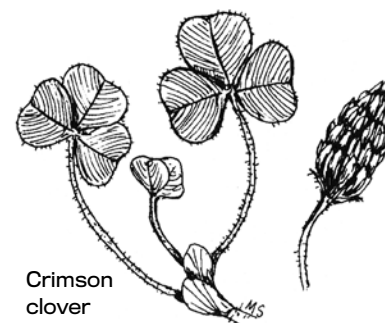
Planting. Plant oats in late summer or early fall, allowing them to mature before frost sets in. Sow 2 to 2½ pounds per 1,000 square feet.

Die-back. Oats die back with a hard frost, leaving beautifully thick straw mulch by spring. Just dig holes into your oat straw and "no-till" plant your spring crop into it, adding compost for nitrogen. Or you can dig the residue under, wait a couple weeks, and plant your following crop.

Crimson Clover

SPRING-BLOOMING BEAUTY

This clover's deep crimson flowers are eye-catching, not to mention bee-catching. Crimson clover (*Trifolium incarnatum* L.) draws pollinators and other beneficial insects to prey on pests lurking near your vegetable crops.

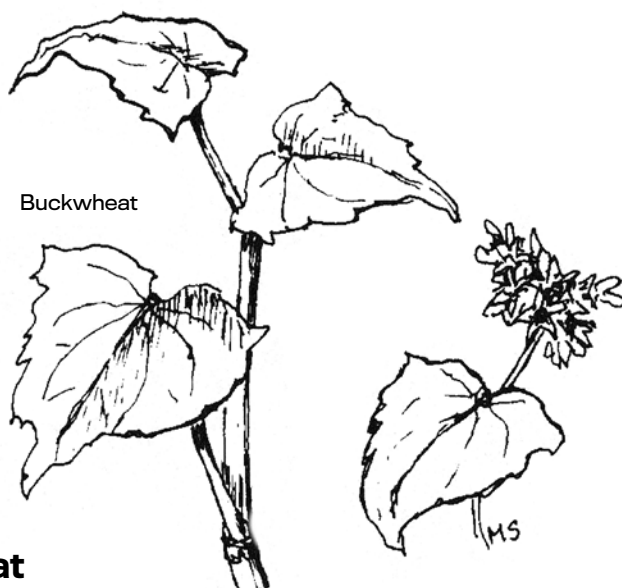


Crimson clover

Planting. Planted at about ½ pound per 1,000 square feet, it can potentially fix upwards of 100 pounds of nitrogen per acre. Broadcast the tiny seeds and rake them gently into the soil. Plant crimson clover in late summer for midspring incorporation.

Living mulch. Try crimson clover as a living mulch, interspersed in your

vegetables, for three reasons: weed suppression, nitrogen fixation, and a beneficials attraction. "Sprinkle crimson clover seeds under your tomatoes in spring and let it fill in the spaces between plants," says Pam Ruch, manager of the OG Test Garden near Emmaus, Pennsylvania. "The clover blooms the following spring."



Buckwheat

SPEEDY SEEDS

Sometimes called a “smother crop” because it shoots up fast enough that it shades out weeds with its broad leaves, buckwheat (*Fagopyrum esculentum* Moench) is your ideal nonlegume summer cover crop. “Plant it after you pull out your early crops, and turn it under before planting greens in late summer,” says Ruch. Buckwheat grows and flowers in just 6 weeks, and the flowers attract lots of pollinators. Broadcast 1 to 2½ pounds per 1,000 square feet.

Bee-nificials. Dave Wilson, research agronomist at the Rodale Institute, has observed the visible pollinators buckwheat draws: “Honeybees and bumblebees are noticeable bio-indicators because they are big enough to see easily; if they are there, you know that many other beneficial insects are there as well.”

Bonus. Buckwheat also increases soil calcium, available phosphorus, and potassium.



Sorghum-Sudangrass

EASE YOUR TROUBLES

Plant sorghum-sudangrass (*Sorghum bicolor* (L.) Moench × *S. bicolor* var. *sudanense*) if you want to recover a troubled plot with the maximum organic matter and allelopathy of a warm-season cover crop.

Managing. Sow 1 pound per 1,000 square feet. “If you whack it back once during the summer when it’s 3 to 4 feet tall, you’ll stimulate increased root growth to deeper levels, which is very good for building organic matter and improves the soil tilth and soil structure. Doing this will make it grow new stems,

or tillers—the young tillers are not as tough as mature ones, and they will decompose more easily,” says Wilson.

Test-gardener approval. “In our test garden, we renovated a bed that had a severe thistle problem by planting Piper sudangrass in late spring, cutting it back 3 feet in summer, and letting it die in winter,” Ruch reports. “The bed is now thistle-free, and the soil is beautiful.”

Cover crops: Also called green manures, these crops can improve even the most troublesome soils.

Try Lasagna Gardening

From the pages of her best-selling book *Lasagna Gardening*, Patricia Lanza explains the who, what, when, where, why, and how of the easiest no-toil garden soil you will ever meet. No digging. No tilling. No weeding. Super soil and super yields for the hammock-bound or the overworked!

No, it doesn't mean growing your own lasagna! Lasagna gardening is a nontraditional, organic layering method you can use to create better soil while keeping your gardens neat and attractive. (The name comes from the layers you'll be making to create your beds—they might remind you of making lasagna.) Based on a commonsense approach and readily available natural ingredients, lasagna gardening is an easy, time-saving way to install and maintain any kind of garden without removing the sod, digging, or tilling. Close planting and generous mulching greatly reduce the time needed for watering and weeding. And because of the healthy growing environment, lasagna gardens attract fewer garden pests. Using no power tools, heavy equipment, or expensive additives, one person can easily create and enjoy a healthy, productive garden.



Getting Started

Creating any kind of garden, whether traditional or lasagna, starts with two basic questions: What do you want to grow, and where will you put the garden? If you have a large property, you probably have your choice of sites. In this case, you can first decide what you'd like to grow, then choose a spot that fits the needs of those plants. If you want to raise vegetables, for instance, you'll look for a spot that's open and sunny, so you can grow the widest variety of crops.

Those of you with limited space are better off choosing a site first, then selecting the plants that will thrive in the growing conditions that spot has to offer. Sure, most plants will grow in less-than-ideal conditions. But their yield or flowering will be less than optimal, and they'll be more prone to pests and diseases. By matching the plants to the site, you'll be well on your way to creating a naturally healthy, top-producing, easy-care garden.

If you have plenty of possible sites for a new garden, it can be difficult to decide on the perfect spot. Start with a plan of your property—nothing formal, just an outline of the property drawn roughly to scale, with buildings, the driveway, and other permanent features (such as trees, large shrubs, play areas, patios, and walkways) sketched in. Make a few photocopies of this base plan, so you can make notes on one copy and pencil in different garden layouts on another copy without messing up the original. Take a copy of your base plan and head out to your yard. Now, take a good look around.

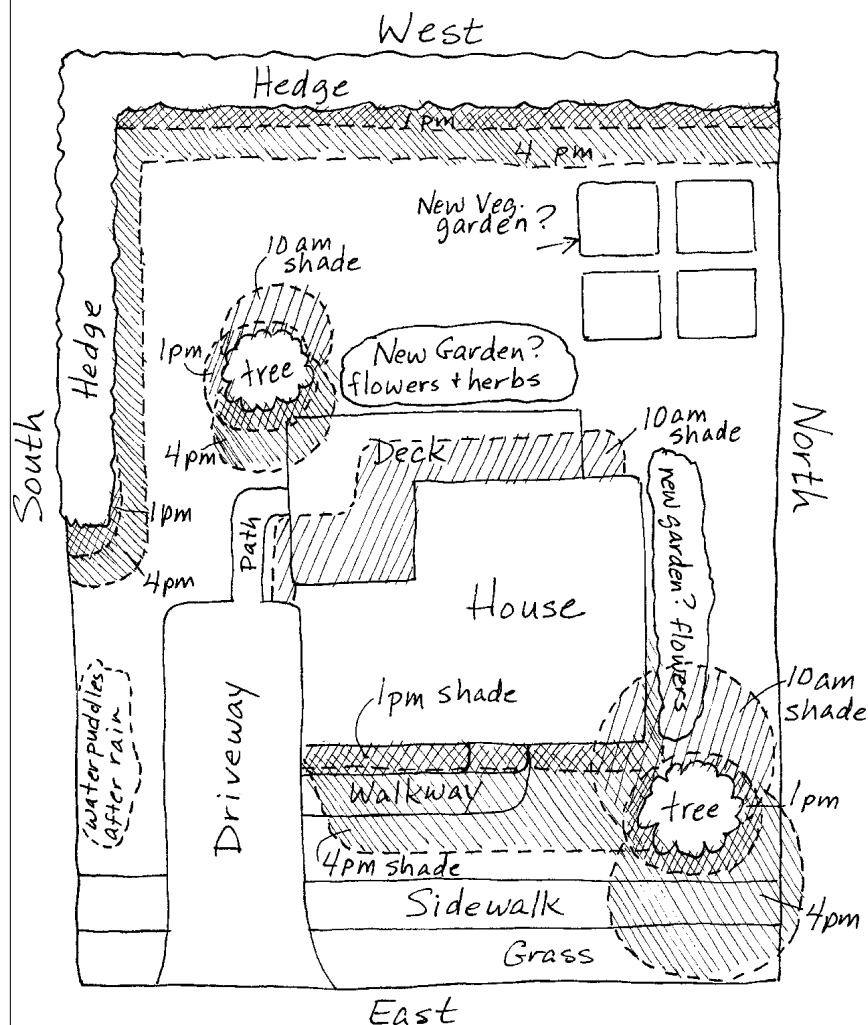
Sun and shade. The easiest things to observe are the shade patterns cast by trees, buildings, and other features. On your plan, use a pencil or crayon to color in the areas that are in shade. Actually, it's smart to repeat this exercise in the morning, at midday, and again in the afternoon, so you can get an accurate assessment of how many hours of sunlight the different areas get during the day.

A site that's in full sun for 8 or more hours every day gets enough light to support a wide variety of vegetables, fruits, herbs, and flowers. Many of the same plants can get by on 6 to 8 hours of sun, although they may not yield as much or flower as generously as when growing in full sun. Spots with less than 6 hours of sun a day can still support great gardens, but you'll need to choose your plants more carefully to find the ones that thrive in somewhat shady spots.

Water and wind. Next, take a closer look at the ground. As you walk around, note any areas where water forms puddles after a heavy rain or

Anything Goes!

Lasagna gardens aren't limited by problem soils. Since you'll be building the soil up instead of digging down, you have a lot more flexibility when it comes to selecting a site.



Make notes. Jot down comments about your soil conditions, shade patterns, and other observations on a copy of your yard map. It will help you identify a good site now and will be handy for planning future gardens.

Planning Your Plantings

With careful planning, a single lasagna garden can serve several purposes. You might, for instance, combine vegetables, herbs, and flowers in one area. You'll have your dinner veggies next to their seasonings, along with a few flowers for a table bouquet. If you're just starting out, though, you'll probably find it easier to keep it small and concentrate on a single theme.

spots that feel soggy underfoot, and mark them on your plan. These poorly drained spots are less than ideal for most garden plants because soggy soil tends to rot roots—it's better to choose a drier site for your lasagna garden.

Think about how the wind blows through your property. Some wind is good, since it circulates air around your plants and helps leaves and stems dry quickly after rain, discouraging diseases. An open site that's frequently exposed to strong gusts can be a problem, though, since the wind draws water out of plants quickly and may cause them to wilt. Wind can also knock down taller plants. If you live on top of a hill or another frequently windy location, choose a site where your lasagna garden will be sheltered by shrubs, trees, a fence, or a building.

Once you've decided on a spot for your garden, and you have some idea of what you want to grow, it's time to take

a closer look at your soil—specifically, its pH. Use the techniques suggested in “Testing 1,2,3” on page 6 to take a soil sample and ready it for the soil-testing lab. Or you can rely on a simple home test kit that lets you check your garden's pH. With lasagna gardening, you have total control over what goes into your soil, so you can build soil that is pretty near perfect for growing most home crops. Whichever testing approach you take, be sure to jot down whatever results you end up with. You'll refer to these notes later, as you choose and apply your lasagna ingredients.

Gathering Ingredients and Making Lasagna

The key ingredients in any lasagna garden are organic materials. These include shredded leaves and other mulches; compost; and other materials recycled from garden and household wastes, such as grass clippings, coffee grounds, and vegetable peelings. Gather as much of these nutrient-rich materials as you can from your own property, and see if your neighbors are willing to share any organic materials they don't use for their own gardens.

The Recipe

Mulch is a main ingredient in lasagna gardening. Understanding mulch—what it is, what it does, what organic materials make good mulch, and where to get them—is the first step in becoming a committed lasagna gardener. What is mulch, and what does it do? Basically, a mulch is anything that covers and shields

your soil from baking sun, drying wind, and pounding rain. This could include a layer of chopped leaves, a sheet of black plastic, or even closely spaced plants. But for the purposes of lasagna gardening, we're specifically interested in organic mulches. While these mulches cover and protect the soil, they also release materials that feed earthworms and other helpful soil organisms. In turn, these organisms release nutrients in a form that plant roots can absorb. Think of it this way: Organic mulches feed your soil, and the soil feeds your plants.

What are some good, easy-to-use organic mulches, and where do you get them? Some of the most popular ones are listed in "Lasagna Mulch Materials" below. One of the most useful mulches is newspaper. Dispose of all the colored and glossy pages and keep the regular part of the paper. What used to be a disposal problem becomes a great source of free mulch for your lasagna garden.

It's also worth looking into regionally available mulches. If you live in a rural area you probably have easy access to

Earthworms Strike Again

Lasagna gardens are full of earthworms. Why? Because they provide the conditions worms thrive in: moderate temperatures, darkness, and moisture, with plenty of organic matter to feed on. Earthworms are drawn to the cool darkness and ingest the organic material. As they digest leaves, grass, and other mulch material, they deposit earthworm castings, a humus-rich soil amendment. You build the right environment and provide food, and the earthworms do the rest!

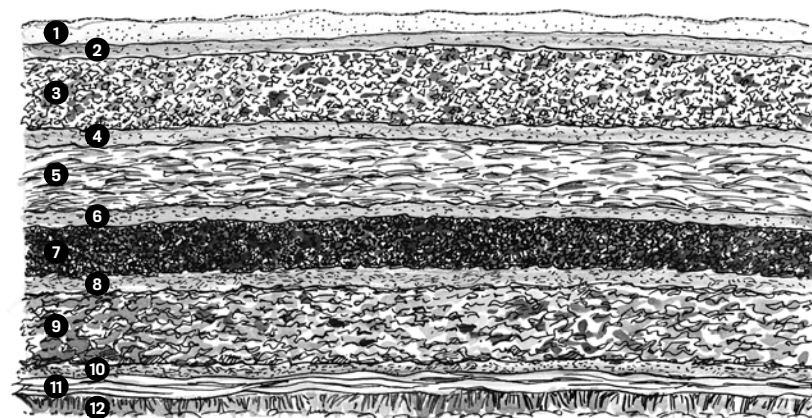
straw. Coastal gardeners can gather seaweed. If you live near a brewery or feed mill, you might be able to get spent hops, buckwheat hulls, or other by-products free for the hauling, or for just a few dollars. To find sources for these locally available materials, talk to other

Lasagna Mulch Materials

Here's a list of ingredients that can build the layers of a lasagna garden. Some are widely available; others may be common only in certain regions. Use this list to get ideas, but don't be limited by it. Many other great mulch materials are available if you look around for them.

- Compost
- Grass clippings
- Leaves
- Manure (must be fully composted)
- Newspapers
- Sawdust
- Seaweed/kelp (rinsed)
- Stalks (chopped)
- Straw
- Wood ash

Lasagna garden layers: The exact materials you use to create your own lasagna beds will depend on what you have readily available.



- | | | |
|------------------|-------------------|---------------|
| 1 Wood ash | 5 Grass clippings | 9 Barn litter |
| 2 Compost | 6 Compost | 10 Compost |
| 3 Chopped leaves | 7 Soil | 11 Newspaper |
| 4 Compost | 8 Compost | 12 Sod |

gardeners in your area. When you develop a mulch mentality, you'll start finding mulch materials in the most unlikely places!

Most of us spend a lifetime disposing of our waste products from home and garden as quickly as possible. You may have a garbage disposal where you push kitchen scraps out of sight. Yard waste is bagged and put out on the curb. But once you start lasagna gardening, you'll realize that you've been throwing away valuable organic matter—and paying for the privilege. Sure, it will take a bit of time to change old habits, but it's worth the effort. Mulch and compost make your garden come alive!

5 Fast Uses for Compost

There's a reason gardeners refer to compost as "black gold." It's a great addition to lasagna layers, but if your supply is limited, save it for special uses.

- Mulching new plantings
- Enriching potting mix
- Giving transplants a good start
- Fertilizing summer vegetables
- Creating a seedbed

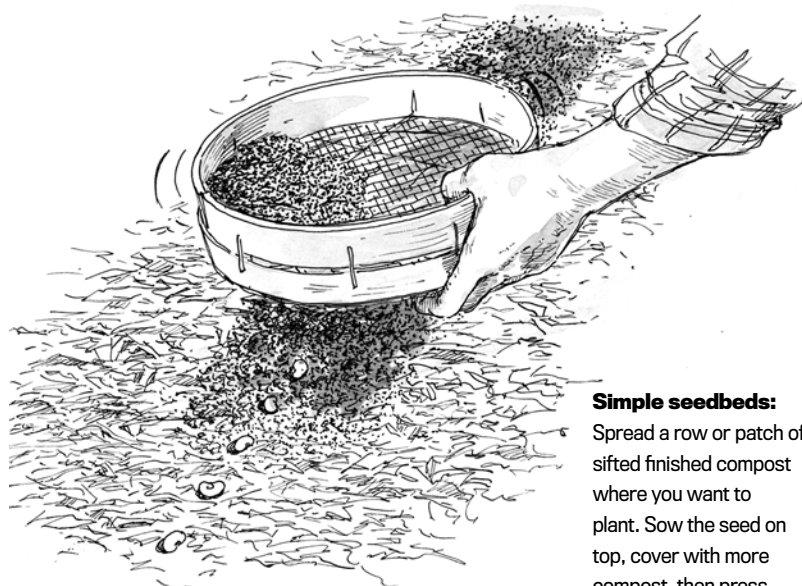
Building Your Layers

You've selected the perfect site and assembled all your ingredients, so let's get this lasagna garden started! First, mark the outline of the garden on the ground, with either stakes and string or a sprinkling of flour. An area roughly 4 × 8 feet won't take a lot of ingredients but will give you room to grow several different crops.

For the first layer, you'll need something heavy to choke out the grass and weeds. Try thick pads of wet newspaper. (Soak it in a large plastic bucket.) Lay them close together, so the edges overlap slightly, to keep weeds from sneaking through. Another good option is flattened, overlapping

cardboard boxes. Next, add a 2- to 3-inch layer of compost to cover the paper or cardboard. Now, spread a 4- to 8-inch layer of organic mulch material over the compost. Add another layer of compost, another layer of mulch, and so on, until the beds are 18 to 24 inches high. Top the layers with a scattering of bonemeal and wood ash to provide extra phosphorus and potassium. That's it!

The exact materials you'll use for your lasagna depend on what you have readily available. Depending on the season, you'll probably use somewhat different layers—the results will be the same. Whatever you decide will be right: The important thing is to do it!



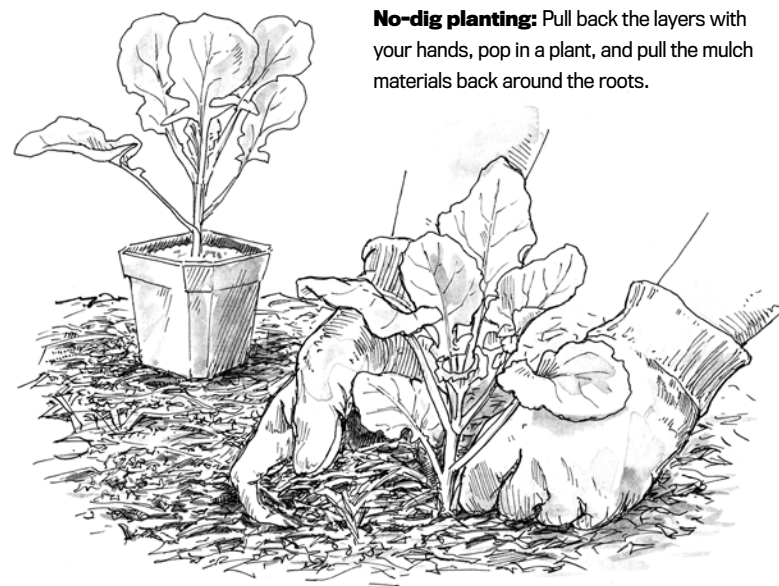
Simple seedbeds:

Spread a row or patch of sifted finished compost where you want to plant. Sow the seed on top, cover with more compost, then press down to firm the bed.

Lasagna gardening can be started in either spring or fall, but the layering techniques as well as the materials are a little different depending on the season in which you're working. In spring, you've already spent months staring out of the windows. You've had plenty of time to choose a spot for a new lasagna garden. As soon as the ground dries enough for you to start spring cleanup, you can mark the new spot, lay down newspaper, and begin the lasagna process. There's quite a lot of material in the spring to get a lasagna garden going. If you didn't get around to cleaning up the previous fall (which is fine, as the stalks and

Fall Planting for Flowers and Herbs

Fall isn't just for planting vegetables—it's also a great time to sow seeds of cold-tolerant flowers and herbs, such as calendula (*Calendula officinalis*), pansy, chives, and parsley. In cold climates, they come up in the spring; warm-climate gardeners will see plants and blooms in winter.



No-dig planting: Pull back the layers with your hands, pop in a plant, and pull the mulch materials back around the roots.

seedheads provide food for the birds), clean the gardens as soon as the ground thaws in spring and add this debris in layers to a new garden. This is also a good time to empty your compost bins. The material has had all winter to break down, so it should be nice and crumbly. Stockpile bags of leaves collected from the curb in the fall for spring use. Once you've built the layers, you can plant right away or let it "cook" first, like your compost pile.

For the organic gardener, fall is the bountiful season. Leaves are the backbone of a new lasagna garden, as well as the compost pile. In fact, you can use four times as many chopped leaves as any other organic matter. You've heard the expression "make hay while the sun shines"? In autumn, "collect leaves till the snow falls." Fall is the time of year when you can make real strides in soil building. Whether you are starting a new lasagna garden or rebuilding an existing one, just lay on as many layers of organic material as you can find. Worms are your hardworking soil cultivators, and the

lasagna layers provide a generous supply of worm food. You can plant fall-built lasagna gardens right away, let them "cook" first, or just leave them to break down naturally over winter for spring planting.

Planting in Lasagna

A lasagna garden that's been "cooked," or left to decompose, will be dark and loose like deeply dug soil, so you can set out plants or sow seeds just as you would in a traditional garden. You don't have to wait to plant—you can build the garden and plant it all in the same day.

To plant in a new bed, pull the layers apart, set the plant in the hole, pull the mulch around the roots, and water thoroughly. To sow seeds in a new lasagna garden, spread fine compost and then set the seeds on the surface. Sift more compost to cover the seeds, and press down. When the plants have two true leaves (the leaves that form after the first pair of "seed leaves"), pull some of the coarser mulch around them to keep the soil moist and weed-free.

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